S13). Specifically, a display pattern as shown in **FIG. 6** (*c*) is generated, with the coordinate data being read from the memory **120**, and displayed in an area where the display pattern as shown in **FIG. 6** (*a*) exists. That is, the entire display area for the visual information becomes block.

[**0105**] Thus the display pattern of the selected visual information is changed on the display device **200**, the viscosity of the electrorheological fluid layer **430** of the tactile display device **400** may change. That is to say, an irradiation of a light from the display device **200** disappears, the fluid situation of the electrorheological fluid layer **430** is changed from one situation that soft part and hard part are mixed as shown in **FIG. 6** (*b*), to the other situation that the entire corresponding part becomes softer as shown in **FIG. 6** (*d*).

[**0106**] As described above, once the tactile information changes, the part which has been hard (i.e. the area other than the part corresponding to "1") becomes softer, so that the operator feels a tactile impression as if a button was depressed.

[**0107**] The CPU **110** actuates an internal timer (step S**14**) at the same time of changing such a display pattern, and judges whether or not two seconds lapses from a change of a display pattern (step S**15**). If it is shorter than two seconds (step S**15**: No), the CPU **110** waits with doing nothing. If it is two seconds or longer (step S**15**: Yes), the CPU **110** changes the display pattern back to the former pattern (step S**16**). That is, a display pattern displayed on the display device **200** is recovered to a display pattern as shown in **FIG. 6** (*a*). Once the display pattern is recovered, the CPU **110** terminates the tactile addition process.

[**0108**] Incidentally, although this two seconds is determined as a typical time period for depressing a button as seen in a usual button operation, a time period to be detected by the internal timer may be any value.

[**0109**] As described above, according to the tactile addition process in the second embodiment, it is possible to improve the discomfort feeling which the operator may feel when operating the touch panel apparatus in a simple manner, so that the handling is further improved.

Modified Embodiment

[**0110**] Incidentally, the construction or structure of the touch panel apparatus with tactile display function is not limited to the construction or structure illustrated in the aforementioned embodiments. For example, it is easy to employ a construction or structure as mentioned below. Now, an explanation will be made on a modified embodiment of the present invention, with reference to **FIG. 8**. **FIG. 8** schematically illustrates a structure of a tactile display device **500** of a touch panel apparatus with tactile display function **20** in the modified embodiment of the present invention. Incidentally, in this figure, elements or components the same as in **FIG. 2** carry the same numerals, and the explanation of them is omitted.

[**0111**] In **FIG. 8**, the touch panel apparatus with tactile display function **20** is different from the aforementioned embodiments, in a point that there is provided with the tactile display device **500**, instead of the tactile display device **400**, in which an elastic layer **510** is sandwiched between the photoconductive layer **420** and the electrorheological fluid layer **430**. Incidentally, in **FIG. 8**, the touch panel device **300** and the display device **200** are not shown.

[**0112**] The elastic layer **510** is made of a resin material having a light transmissive property, such as an optically transparent rubber. Thus, this intervening elastic layer **510** further improves the tactile impression when the operator depressed the plastic film **450**. That is, the thickness of the elastic layer **510** in addition to the thickness of the electrorheological fluid layer **430** presents to the operator further improved tactile impression at his/her finger when depressing the plastic film **450**. The voltage applied to the electrorheological fluid layer **430** and the tactile impression obtained from the electrorheological fluid layer **430** are in a trade-off relationship. Therefore, in order to decrease the applied voltage and realize a compact structure of the apparatus, it is necessary to decrease the thickness of the electrorheological fluid layer **430**, while sacrificing the tactile impression. Nevertheless, according to the modified embodiment of the present invention, it is easy to realize the apparatus with the suitable balance between the applied voltage and the tactile impression.

[**0113**] Incidentally, a position of the intervening elastic layer is not limited to the embodiment shown in **FIG. 8**. For example, it is possible to dispose the elastic layer beneath the photoconductive layer **430**. Furthermore, depends on the situation, it is possible to employ a plurality of elastic layers.

[**0114**] The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

[**0115**] The entire disclosure of Japanese Patent Application No. 2004-185323 filed on Jun. 23, 2004 including the specification, claims, drawings and summary is incorporated herein by reference in its entirety.

What is claimed is:

1. A tactile display device disposed on a display screen for outputting display light corresponding to a display pattern, said tactile display device comprising:

a pair of electrodes having a light transmissive property and disposed opposite to the display screen;

a characteristic change layer disposed between said pair of electrodes, said characteristic change layer having a light transmissive property, wherein at least one of conductivity and magnetic permeability of said characteristic change layer changes at each part on the display screen in response to intensity of the display light; and

an electrorheological fluid layer disposed between said pair of electrodes and opposite to said characteristic change layer, said electrorheological fluid layer having a light transmissive property, wherein viscosity of said electrorheological fluid layer changes at each part on the display screen in response to applied voltage applied through said characteristic change layer by said pair of electrodes.